Monroe City, Missouri
Water Supply Study
Route "J" Lake

Monroe City is located in the extreme northeast corner of Monroe County, Missouri.

Monroe City water supply comes from the city owned lake on Route "J" and may be supplemented by a smaller city lake, South Lake, which was not surveyed. This analysis show that the Route "J" lake would be able to supply approximately three times the current demand.

This 95 acre lake is located southeast of Monroe City in Ralls County and has a drainage area of 8.20 square miles.

Average annual rainfall at the Monroe City rain gage for the latest 30 years of record is 40.49 inches. Annual rainfall for 1953 through 1957 is 28.38, 34.63, 38.45, 27.23, and 45.13 inches.

Monroe City Lake analysis consisted of using the NRCS's computer program called "RESOP". This program analyses remaining stored water at the end of each month by summing gains and losses.

Two analysis were made:

1. First run was the year 2001 demand taken from Route “J” Lake.
2. Both lakes was analyzed for the optimum daily use without emptying the lakes during the evaluation period.

STO-AREA Elevation-Storage and Elevation-Area data were determined from June 5, 2002 survey made by USGS.

Route “J” Lake

Elevation (feet)	Area (acres)	Volume (acre-ft)	
638.0	0.10	0.05	
640.0	1.00	1.04	
642.0	4.04	5.47	
644.0	9.01	18.43	
646.0	14.40	41.84	
648.0	19.31	75.44	
650.0	25.18	119.85	
652.0	30.99	175.79	
654.0	37.13	243.87	
656.0	43.46	324.36	
658.0	50.13	417.99	
660.0	56.71	524.80	
662.0	63.70	645.33	
664.0	70.71	779.52	
666.0	79.82	929.37	
668.0	88.37	1097.86	
669.3	94.90	1216.31	W.S. Elevation on 6/5/02
669.6	99.45	1245.65	Spillway Elevation

Starting storage was considered at maximum pool.

The drainage area of the lake is 8.20 square miles.

GENERAL The adjustment factor of 0.76 to convert from pan evaporation to lake evaporation was applied prior to entering the data for the control word EVAP. As a result a factor of 100.

The record period of drought is in the 1950's.
Analysis began in January 1951 and ended December. 1959

SEEPAGE The reservoir seepage varied from 0 seepage near empty to a maximum of 2.50 inches per month at full pool. The seepage rate is a best estimate based on history of the reservoir, soil type, material of the core of the dam and compaction of the earth fill. The material in the dam is compacted earth of clayey soils.

RAINFALL Rainfall data came from the Monroe City, Missouri rain gage.

RUNOFF This is the runoff into the lake from its drainage area. Monthly runoff volumes in watershed inches from the North Fork of Salt River stream gage near Shelbina, Missouri was used. Salt River runoff was compared to North River stream gage runoff at Bethel Missouri. Comparisons were favorable. It was also compared to Monroe City rainfall and if the rainfall results did not appear reasonable, adjustments were made for that month by looking at individual rains and estimating antecedent moisture, then adjusting runoff based on NRCS's runoff curve numbers.

EVAP. Pan evaporation at the Lakeside gaging station was used as a base because it has data for year around evaporation. All other stations only measure data between April through November. Lakeside data was updated during these months with gage data from stations at New Franklin, and Columbia. Depending on the latest data for the station nearest to Monroe City.

DEMAND This was determined by city records. Monroe City has a daily use of 418,360 gallons per day. Based on Year 2001 use of 152,701,000 gallons.

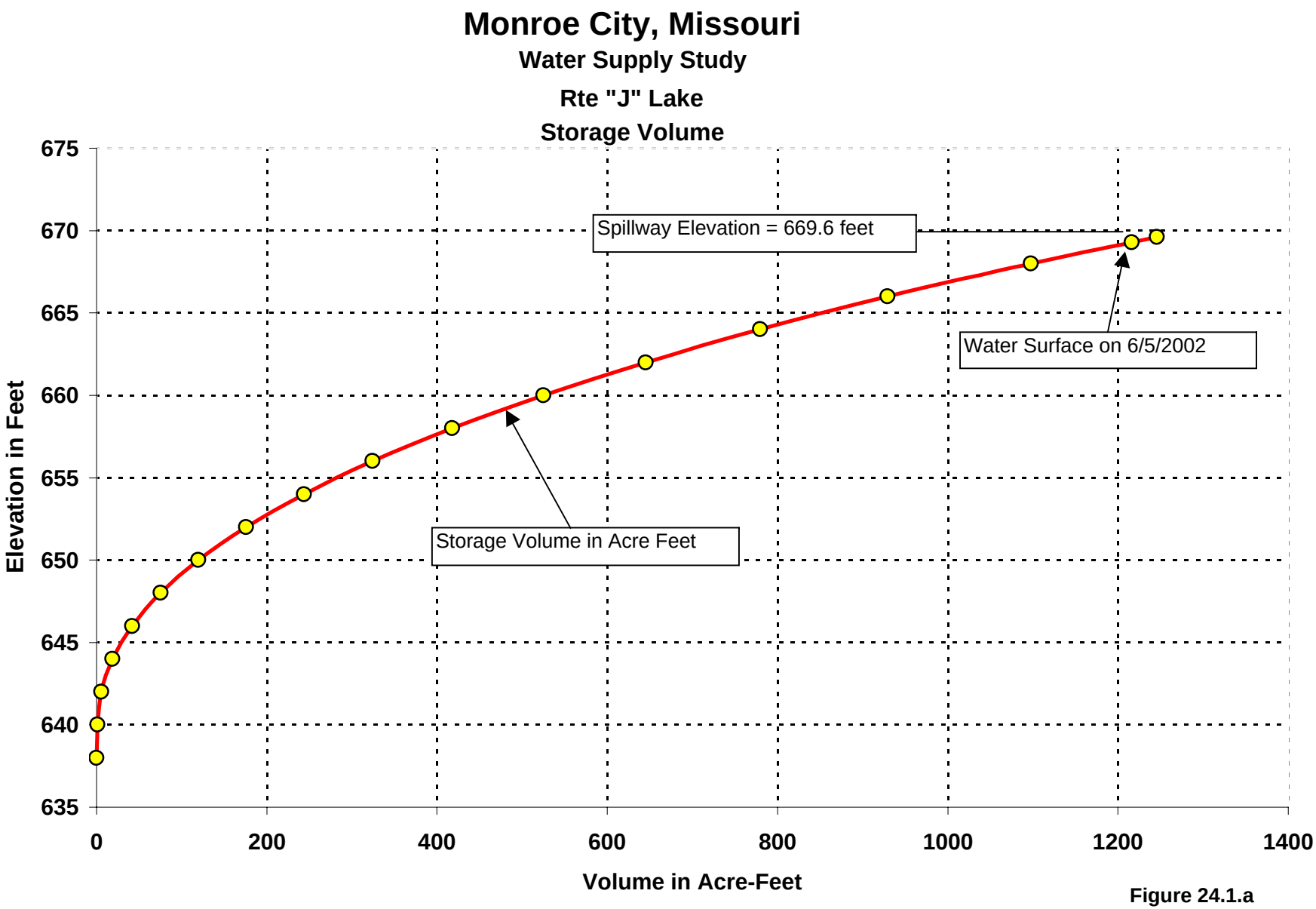

Monroe City, Missouri
Water Supply Study
Rte "J" Lake
Storage Volume
Elevation in Feet
675
670
665
660
655
650
645
640
635
0
200
400
600
800
1000
1200
1400
Volume in Acre-Feet
Spillway Elevation = 669.6 feet
Water Surface on 6/5/2002
Storage Volume in Acre Feet

Figure 24.1.a

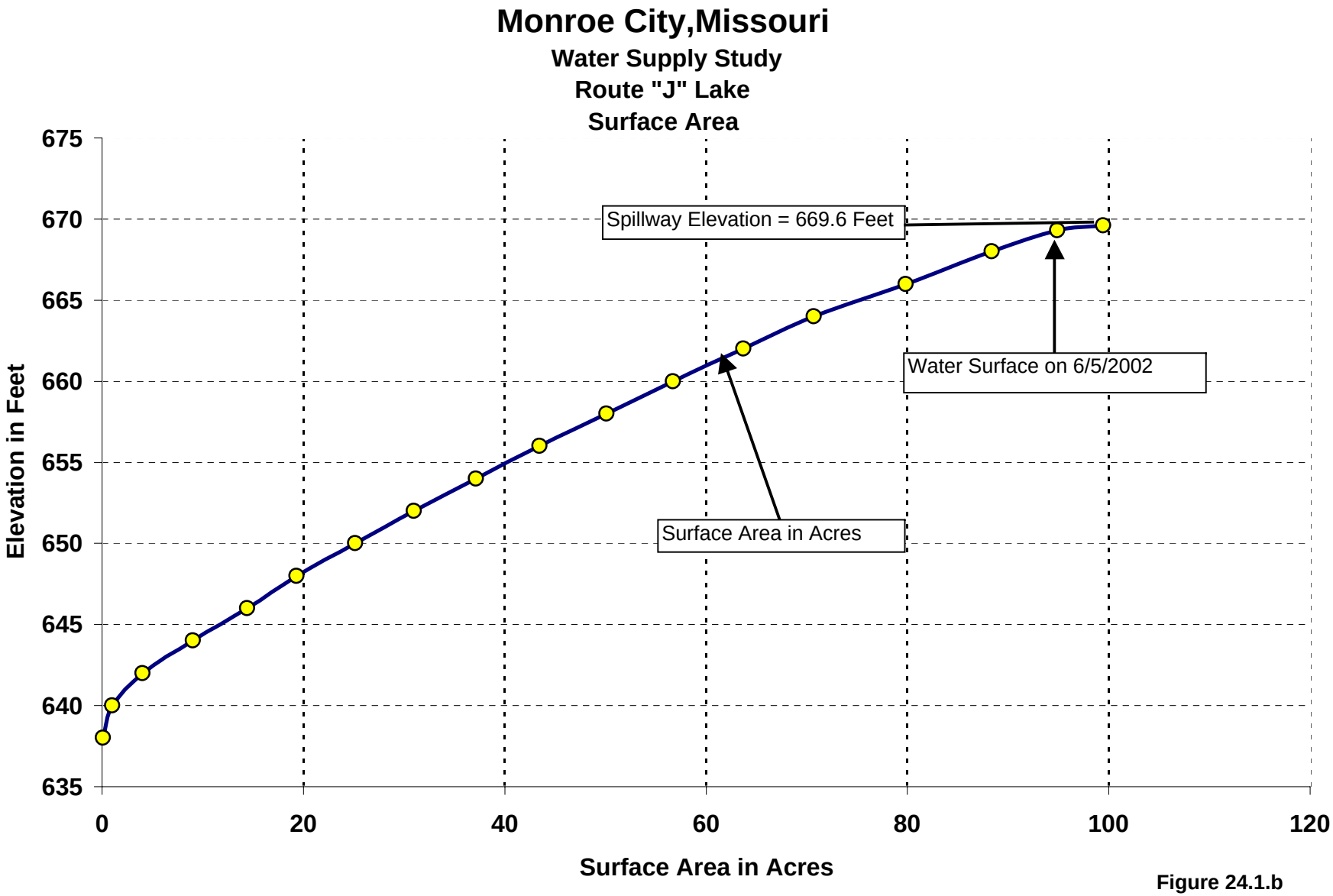

Monroe City,Missouri
Water Supply Study
Route "J" Lake
Surface Area
Elevation in Feet
675
670
665
660
655
650
645
640
635
0
20
40
60
80
100
120
Surface Area in Acres
Spillway Elevation = 669.6 Feet
Water Surface on 6/5/2002
Surface Area in Acres

Figure 24.1.b

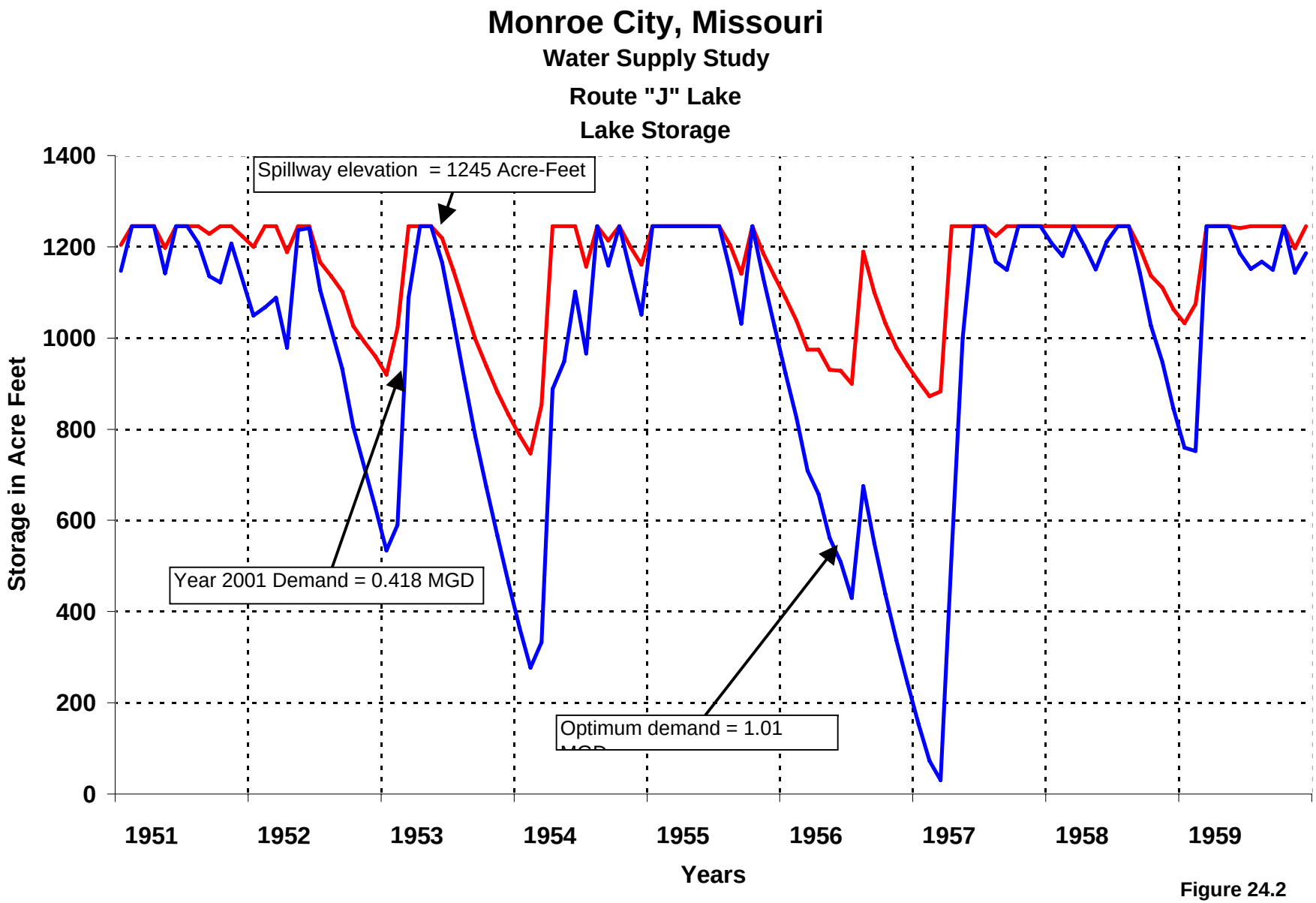

Monroe City, Missouri
Water Supply Study
Route "J" Lake
Lake Storage
Storage in Acre Feet
1400
1200
1000
800
600
400
200
0
Spillway elevation = 1245 Acre-Feet
Year 2001 Demand = 0.418 MGD
Optimum demand = 1.01
1951
1952
1953
1954
1955
1956
1957
1958
1959
Years

Figure 24.2

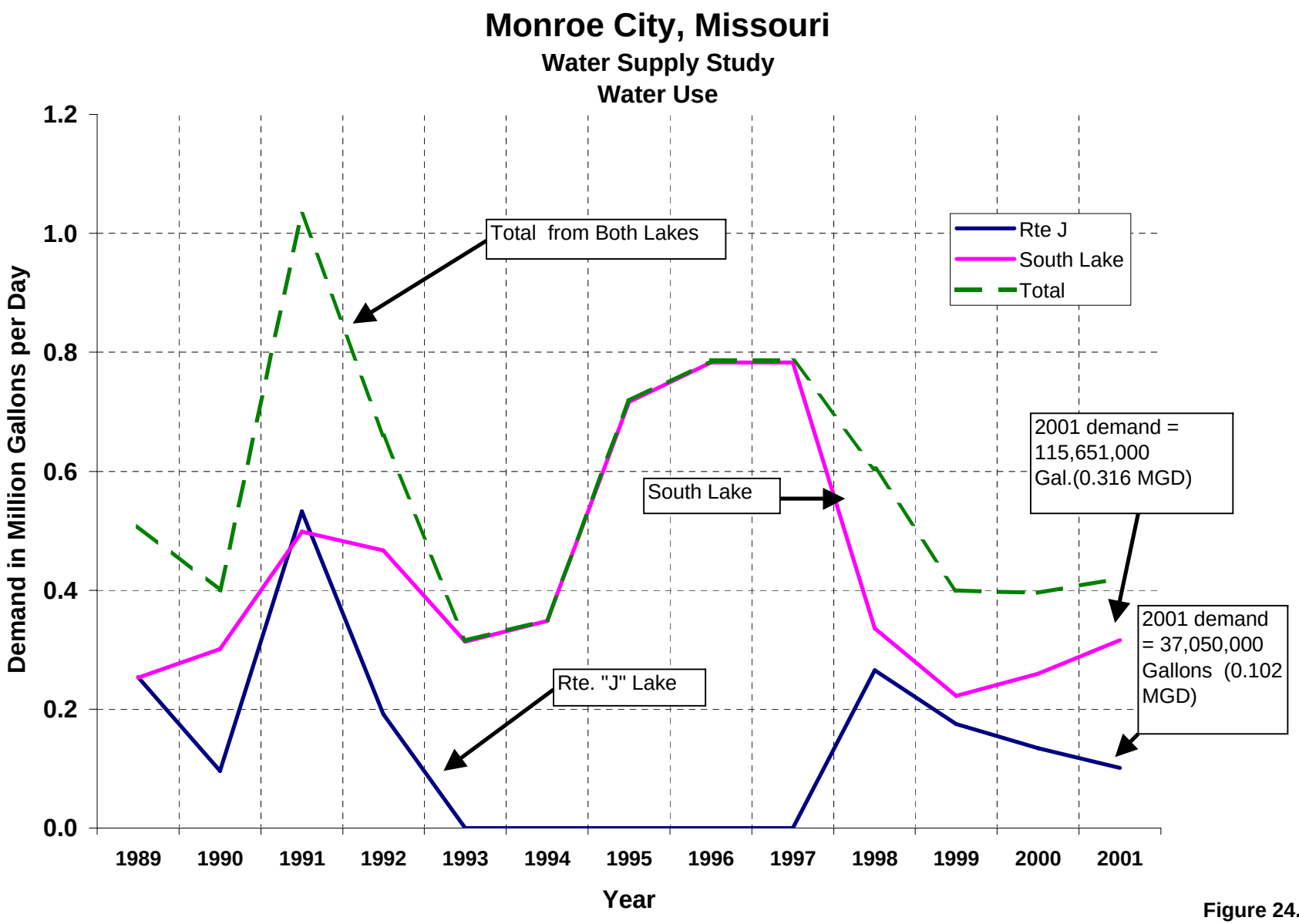
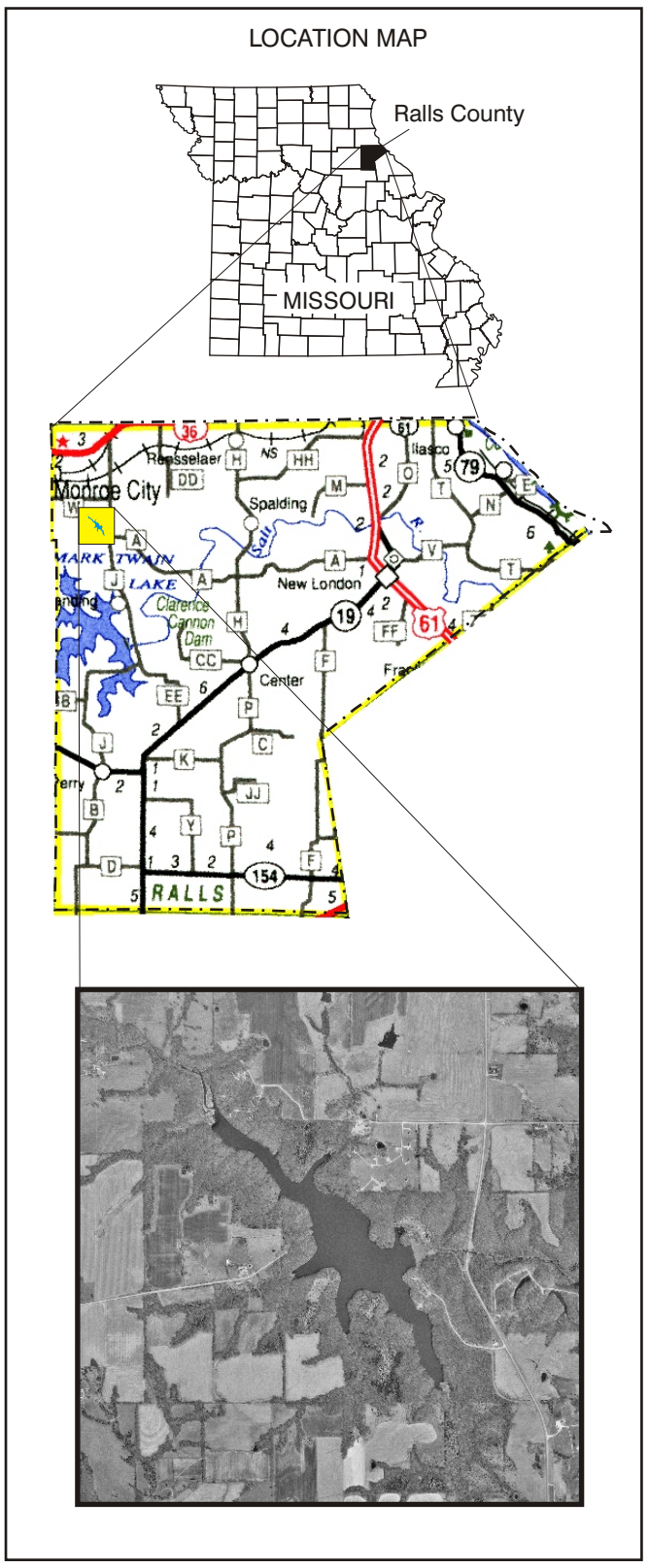

Monroe City, Missouri
Water Supply Study
Water Use
Demand in Million Gallons per Day
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
Year
Rte J
South Lake
Total
Total from Both Lakes
South Lake
Rte. "J" Lake
2001 demand = 115,651,000 Gal.(0.316 MGD)
2001 demand = 37,050,000 Gallons (0.102 MGD)

Figure 24.3

MONROE CITY LAKE

Elevation (feet)	Area (acres)	Volume (acre-ft)
638.0	0.1	0.0
640.0	1.0	1.0
642.0	4.0	5.5
644.0	9.0	18.4
646.0	14.4	41.8
648.0	19.3	75.4
650.0	25.2	119.9
652.0	31.0	175.8
654.0	37.1	243.9
656.0	43.5	324.4
658.0	50.1	418.0
660.0	56.7	524.8
662.0	63.7	645.3
664.0	70.7	779.5
666.0	79.8	929.4
668.0	88.4	1,097.9
669.3	94.9	1,216.3
669.6	99.5	1,245.7

Table 17. Lake elevations and respective areas and volumes. Spillway elevation is 669.6 ft. Datum is sea Level.



EXPLANATION

— 660 — BATHYMETRIC CONTOUR—Shows altitude of the reservoir bottom. Contour interval 2 feet. Datum is sea level.

— 669.3 — WATER SURFACE—Shows elevation of water surface, June 5, 2002 (table 17). Datum is sea level.

⊠ U.S. GEOLOGICAL SURVEY REFERENCE MARKER—Chiseled arrow located on west edge of intake structure. Elevation 679.4 feet. Datum is sea level.

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Figure 24.4 Bathymetric map and table of areas/volumes of the Monroe City Lake near Monroe City, Missouri.